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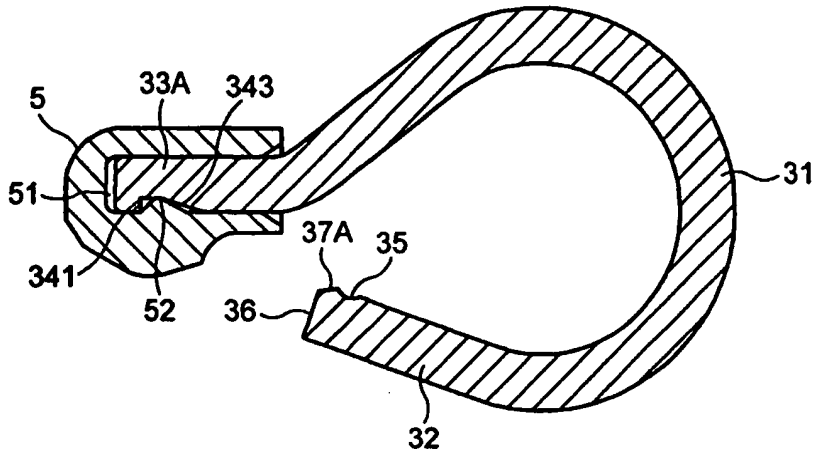
(54) Title: RAILWAY RAIL FASTENING CLIP AND ASSEMBLY



(57) Abstract: A railway rail fastening clip (3), for fastening a railway rail (1) to an underlying rail foundation (2), is formed of an elongate plate shaped such that a central region (31) of the plate has in profile the form of a letter C, a first end region of the plate extending from one side of the central portion (31) of the plate to form a base portion (32) of the clip (3) for engaging a rail fastening anchoring device (4) secured to the rail foundation (2) and a second end region of the plate extending from the opposite side of the central region (31) of the plate to form a toe portion (33) of the clip (3) for bearing on the railway rail (1). The toe portion (33) of the clip (3) is provided with insulator retaining means (34) for retaining thereon a toe insulator (5) for electrically insulating the clip (3) from the rail (1).

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RAILWAY RAIL FASTENING CLIP AND ASSEMBLY

The present invention relates to a railway rail fastening clip, of the kind which is driven onto the rail perpendicularly thereto, and an assembly incorporating that clip.

One type of rail fastening clip which is driven onto the rail perpendicularly thereto is disclosed in EP-B-0619851. This clip is a M-shaped clip formed of a rod of material and can be used with a two-part insulator system, i.e. a toe insulator carried by the toe of the clip and a sidepost insulator which is carried by the clip anchoring device. This clip has the advantage that it can be retained by the clip anchoring device in a pre-assembly position in which the toe of the clip does not bear on the rail and yet also retains the toe and sidepost insulators, thus facilitating track installation and maintenance. However, no clip made of plate material has hitherto been proposed which is operable in the same manner.

According to a first aspect of an embodiment of the present invention there is provided a railway rail fastening clip for fastening a railway rail to an underlying rail foundation, which clip is formed of an elongate plate shaped such that a central region of the plate has in profile the form of a letter C, a first end region of the plate extending from one side of the central region of the plate to form a base portion of the clip for engaging a rail fastening anchoring device secured to the rail foundation and a second end region of the plate extending from the opposite side of the central region of the plate to form a toe portion of the clip for bearing on the railway rail, the toe portion extending further than the base portion, characterised in that the toe portion of the clip is shaped to provide insulator retaining means for

retaining thereon a toe insulator for electrically insulating the clip from the rail.

Preferably, the toe portion of the clip comprises, proceeding from the central region of the plate, a first section, extending towards the base portion of the clip, and then a straight second section extending away from the base portion, the insulator retaining means being provided on said second section.

The insulator retaining means desirably comprise a notch formed in the toe portion for engaging with a projection on the toe insulator, which notch preferably extends across the toe portion.

Preferably, the toe portion is bifurcated and each part of the toe portion is provided with insulator retaining means for retaining thereon respective toe insulators for electrically insulating the clip from the rail. In this case the insulator retaining means preferably comprise respective notches formed in each part of the toe portion for engaging with respective projections on the toe insulators, the notches desirably extending respectively across the parts of the toe portion. Preferably, the central portion of the plate is not bifurcated.

The or each notch may be provided on a lower surface of the toe portion. Preferably, the or each notch has an abutment face which is substantially perpendicular to the direction in which the clip is to be driven onto the rail. In this case, the or each notch also has an inclined face extending away from and opposite to the said abutment surface.

The width of the toe portion may be substantially the same as that of the base portion.

Desirably, the base portion is planar.

In a preferred embodiment the base portion has a recess, provided adjacent to a free end of the base portion, for engaging part of the rail clip anchoring

device. Desirably, the recess is provided on an upper surface of the base portion.

According to a second aspect of an embodiment of the present invention there is provided a railway rail fastening assembly for fastening a railway rail to an underlying rail foundation, characterised in that the assembly comprises a pair of railway rail fastening clips embodying the first aspect of the present invention, each clip carrying at least one toe insulator for electrically insulating the clip from the rail, the or each toe insulator having a cavity within which a toe portion of the clip is located and insulator retaining means provided on the toe portion of the clip engaging corresponding means on the toe insulator.

Preferably, notches on the clips engage respective projections provided inside the toe insulator cavities.

The assembly may further comprise a pair of rail fastening anchoring devices in which respective ones of the rail fastening clips are mounted, each anchoring device having a passageway within which the base portion of a clip is located.

Preferably, an upper surface of each anchoring device is formed with a step for inhibiting unintentional removal of the clip from the device.

The passageway of each anchoring device preferably has a roof. Desirably, a locating projection is formed on the roof inside the passageway in the anchoring device for engaging with a recess on the base portion of the clip.

Preferably, the roof extends over almost the entire passageway.

The assembly may further comprise a pair of sidepost insulators for insulating the anchoring devices from the rail, each anchoring device having means for locating a sidepost insulator thereon.

Each anchoring device preferably has an aperture at the end of the passageway opposite to an entrance thereof, and each sidepost insulator has a portion which projects into that aperture, the portion of the sidepost insulator projecting into the aperture having a recess therein into which the base portion of the clip projects, thereby to prevent vertical displacement of the sidepost insulator.

Alternatively, or additionally, each anchoring device may have a protrusion and a recess at the end of the passageway adjacent to the sidepost insulator and each sidepost insulator may have a protrusion which projects into the recess, which protrusions act to resist unintentional vertical displacement of the sidepost insulator.

Reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 shows a side view, partly in cross-section taken on line I-I in Figure 3, of a railway rail fastening assembly embodying the present invention;

Figure 2 shows a plan view of the assembly of Figure 1;

Figure 3 shows a rear view of the assembly of Figure 1;

Figure 4 shows a side view of a railway rail fastening clip embodying the present invention;

Figure 5 shows a plan view from above of the clip of Figure 4;

Figure 6 shows a front view of the clip of Figure 4;

Figure 7 shows an enlarged side view of part of the clip of Figure 4;

Figures 8A and 8B show respective cross-sectional views, taken on the line VIII-VIII in Figure 5, of the clip of Figure 4 and an insulator before and after

attachment of the insulator to the clip;

Figure 9 shows a front view of a rail fastening anchoring device for use in the assembly of Figure 1;

Figure 10 shows a plan view from above of the device of Figure 9;

Figure 11 shows a rear view of the device of Figure 9;

Figure 12 shows a cross-sectional side view taken on the line XII-XII in Figure 11;

Figure 13 shows a cross-sectional plan view taken on the line XIII-XIII in Figure 11;

Figure 14 shows a view of the assembly of Figure 1 with the clip in a pre-assembly position; and

Figure 15 shows modifications to the assembly of Figure 1, Figure 15A showing a front view of a modified sidepost insulator, Figure 15B showing a partial cross-sectional side view taken on the line XV in Figure 15A and Figure 15C showing a side view of a modified anchoring device.

The assembly of Figure 1 comprises a railway rail 1 fastened to an underlying rail foundation 2 by means of a pair of railway rail fastening clips 3 embodying the present invention which are anchored in respective rail fastening anchoring devices 4 and carry respective toe insulators 5 for electrically insulating the clip 3 from the rail 1. The foot of the rail 1 rests on a resilient rail pad 6 and the rail fastening anchoring devices 4 are insulated from the rail 1 by means of sidepost insulators 7.

The assembly is designed to allow the clip 3 to be driven into the anchoring device 4 so as to be held in a pre-assembly position in which the toe and sidepost insulators 5, 7 are held captive, allowing rail foundations 2 to be delivered to site already equipped with a complete rail fastening assembly, which greatly improves the speed of track installation. After

installation the clip 3 can also be driven off the rail 1 back into the pre-assembly position, thereby allowing track maintenance to be carried out without the need to remove the clips 3 from the anchoring devices 4.

A clip 3 embodying the present invention is shown in Figures 4 to 7. Clip 3 is made from an elongate plate shaped so as to have a central portion 31 having in profile the form of a letter C. A planar part extending from one end of the C-shaped part 31 forms a base portion 32 of the clip 3. Adjacent to a free end 36 of the base portion 32 there is formed a recess 35 which extends across an upper surface of the base portion 32. The recess 35 engages with part of the rail fastening anchoring device 4 when the clip 3 is installed therein to assist in locating the clip 3 in the anchoring device 4. The free end 36 of the base portion 32 has a chamfer on its upper edge 37A. On the other side of the central portion 31 the plate is bent to form a toe portion 33 of the clip 3. The toe portion 33 comprises two parts 33A and 33B separated by a gap 38, each of the parts 33A, 33B having across respective lower surfaces thereof respective notches 34A, 34B, adjacent to the free ends 39A, 39B of the parts 33A, 33B. The free ends 39A, 39B have respective upper and lower chamfered edges 40A, 40B. The first section of the toe portion 33 bends down from the end of the central portion 31 towards the base portion 32 and then a second section of the toe portion 33 extends away from the central portion 31 and base portion 32.

The notches 34A, 34B each have, as shown most clearly in Figures 8A and 8B, an abutment face 341 substantially perpendicular to the direction in which the clip is to be driven, and in this embodiment also substantially parallel to the end face 39A, and an inclined face 343, joined together by a wall 342 which extends approximately perpendicularly to the abutment

face 341. The notches 34A, 34B are provided as means for retaining the insulators 5 on the toe of the clip 3. As shown in Figures 8A and 8B, each insulator 5 is made of electrically insulating material having a cavity 51 shaped so as to fit snugly onto the second section of the part 33A or 33B of the toe portion 33. Insertion of the second section of the toe parts 33A, 33B into the insulators 5 is eased by the provision on the toe parts 33A, 33B of the chamfered edges 40A, 40B. Inside the cavity 51 a projection 52 is formed which, when the part 33A or 33B is inserted into the cavity 51, the chamfered edge 40B of the part 33A (33B) rides up and over, the part 33A (33B) coming to rest within the insulator cavity 51 such that the projection 52 is located in the notch 34A (34B). The material of the insulator 5 beneath the cavity 51 is thicker than that at the top thereof and is shaped so as to have no sharp corners which would impede the driving of the clip 3 onto the rail 1. The notches 34A, 34B are designed such that the insulators 5 are retained firmly on the toe 33 of the clip 3 during both driving of the clip 3 into the anchoring device 4 and withdrawal of the clip 3 from the rail 1.

By way of example only, a clip embodying the present invention may have the following dimensions: the clip width, which is constant at the toe portion, base portion and central region, is 76mm; the clip length as measured perpendicularly from the end face 39A (39B) to the furthest outer edge of the central region 31 is 92mm; the central region 31 has an inner diameter of 42mm; the length from the end face 36 to the furthest outer edge of the central region is 56mm; the base portion 32 extends at an angle of 19° to the second section of the toe portion 33; the recess 35 has a depth of 0.5mm and the surface of recess 35 has a radius of curvature of 2mm, the centre of which is

located 4mm from the end face 36 of the base portion 32; the abutment face 341 of the notch 34A (34B) is 2mm long and is located 4mm from the end face 39A (39B) of the toe part 33A (33B), the wall 342 extends for a further 3mm and the inclined face 343 is inclined at an angle of 15.9° to the second section of the toe portion 33; the length of the second section of each toe part 33A, 33B is 21.35mm, the radius of curvature of the bend in the toe parts 33A, 33B being 10mm; and the height of the toe portion 33 above the base portion 32 is 9mm.

The rail fastening anchoring device 4 of the assembly shown in Figures 1 to 3 is shown in more detail in Figures 9 to 13. Anchoring device 4 has an upper section 41 which extends above the rail foundation 2 and a lower section 42 which extends into the rail foundation 2. Lower section 42 includes a pair of legs 43 designed to prevent vertical and horizontal displacement of the anchoring device 4 in the rail foundation 2. The upper section 41 of the device 4 provides a body 44 through which there is a passageway 45 having an entrance 46 at the rear of the anchoring device 4. The passageway 45 has a roof 47 which extends over almost all of the passageway 45; an opening 49 is left in the roof 47 to receive a part 71 of the sidepost insulator 7 which in use is located on the front of the anchoring device 4. Since the passageway 45 is enclosed, track ballast cannot intrude into the anchoring device 4, thereby ensuring that withdrawal of the clip 3 from the rail 1 and subsequent driving of the clip 3 back onto the rail 1 are not impeded. An end portion 48 of the roof 47 inside the passageway 45 which is adjacent to the front of the anchoring device 4 serves as a locating projection which engages the recess 35 in the base portion 32 of the clip 3. As mentioned above, the sidepost insulator

7, as shown most clearly on the lefthand side of Figure 1, has a portion 71 which projects into the aperture 49 in the roof 47. A recess 72 is formed in the portion 71 and the free end 36 of the base portion 32 extends into this recess 72 so as to prevent vertical displacement of the sidepost insulator 7.

The clip 3 has three points of contact with the assembly, that is between the toe portion 33 and the rail, between a lower portion of the C-shaped part 31 and the base of the anchoring device 4, and between the recess 35 in the base portion 32 and the end portion 48 of the anchoring device 4.

As shown in Figure 14, on installation of the clip 3 into the device 4, or on subsequent withdrawal of the clip 3 from the rail 1, the clip 3 can be "parked" in a pre-assembly position in which the free end 36 of the base portion 32 bears against the roof 47 of the passageway 45 and the toe insulator 5 bears on an upper surface 441 of the body 44 of the device 4 which is formed with a step 442 to inhibit unintentional withdrawal of the clip 3 from the device 4.

A modification to the assembly of Figure 1 is shown in Figures 15A, 15B and 15C. As shown in Fig. 15C, an anchoring device 4', similar in other respects to the anchoring device 4 of Figure 1, is provided with respective outer wings 400' at each side of the body 44' of the anchoring device 4', each wing 400' being formed, on the side facing away from the rail 1 when in use, with a protrusion 401'. Below each protrusion 401' a recess 402' is formed. As shown in Figs. 15A and 15B, a sidepost insulator 7', similar in other respects to the sidepost insulator 7 of Figure 1, is formed at end parts 700' thereof with respective protrusions 701', which, when the sidepost insulator 7' is pushed vertically downwards onto the front of the anchoring device 4', is displaced by the protrusion

401' on the anchoring device 4'. Upon passing the protrusion 401', the protrusion 701' on the sidepost insulator 7' returns to its undeflected condition and sits in the recess 402', thereby resisting unintentional vertical displacement of the insulator 7'.

CLAIMS:

1. A railway rail fastening clip (3) for fastening a railway rail (1) to an underlying rail foundation (2), which clip (3) is formed of an elongate plate shaped such that a central region (31) of the plate has in profile the form of a letter C, a first end region of the plate extending from one side of the central region (31) of the plate to form a base portion (32) of the clip (3) for engaging a rail fastening anchoring device (4) secured to the rail foundation (2). and a second end region of the plate extending from the opposite side of the central region (31) of the plate to form a toe portion (33) of the clip (3) for bearing on the railway rail (1), the toe portion (33) extending further than the base portion (32), characterised in that the toe portion (33) of the clip (3) is shaped to provide insulator retaining means (34A, 34B) for retaining thereon a toe insulator (5) for electrically insulating the clip (3) from the rail (1).

2. A clip as claimed in claim 1, wherein the toe portion (33) comprises, proceeding from the central region (31) of the plate, a first section, extending towards the base portion (32) of the clip (3), and then a straight second section extending away from the base portion (32), the insulator retaining means (34A, 34B) being provided on said second section.

3. A clip as claimed in claim 1 or 2, wherein the insulator retaining means (34A, 34B) comprise a notch (34A, 34B) formed in the toe portion (33) for engaging with a projection (52) on the toe insulator (5).

4. A clip as claimed in claim 3, wherein the notch (34A,34B) extends across the toe portion (33).

5. A clip as claimed in claim 1 or 2, wherein the toe portion (33) is bifurcated and each part (33A, 33B) of the toe portion (33) is provided with insulator

retaining means (34A, 34B) for retaining thereon respective toe insulators (5) for electrically insulating the clip (3) from the rail (1).

6. A clip as claimed in claim 5, wherein the insulator retaining means (34A, 34B) comprise respective notches (34A, 34B) formed in each part (33A, 33B) of the toe portion (33) for engaging with respective projections (52) on the toe insulators (5).

7. A clip as claimed in claim 6, wherein the notches (34A, 34B) extend respectively across the parts (33A, 33B) of the toe portion (33).

8. A clip as claimed in any one of claims 5 to 7, wherein the central portion (31) of the plate is not bifurcated.

9. A clip as claimed in any one of claims 3, 4, 6 or 7, or claim 8 when read as appended to claim 6 or 7, wherein the or each notch (34A, 34B) is provided on a lower surface of the toe portion (33).

10. A clip as claimed in any one of claims 3, 4, 6, 7 or 9, wherein the or each notch (34A, 34B) has an abutment face (341) which is substantially perpendicular to the direction in which the clip (3) is to be driven onto the rail (1).

11. A clip as claimed in claim 10, wherein the or each notch (34A, 34B) has an inclined face (343) extending away from and opposite to the said abutment surface (341).

12. A clip as claimed in any preceding claim, wherein the width of the toe portion (33) is substantially the same as that of the base portion (32).

13. A clip as claimed in any preceding claim, wherein the base portion (32) is planar.

14. A clip as claimed in any preceding claim, wherein the base portion has a recess (35), provided adjacent to a free end (36) of the base portion (32), for engaging part (48) of the rail clip anchoring device

(4).

15. A clip as claimed in claim 14, wherein the recess (35) is provided on an upper surface of the base portion (32).

16. A railway rail fastening assembly for fastening a railway rail (1) to an underlying rail foundation (2), characterised in that the assembly comprises a pair of railway rail fastening clips (3) as claimed in any preceding claim, each clip (3) carrying at least one toe insulator (5) for electrically insulating the clip (3) from the rail (1), the or each toe insulator (5) having a cavity (51) within which a toe portion (33) of the clip (3) is located and insulator retaining means (34A,34B) provided on the toe portion (33) of the clip (3) engaging corresponding means (52) on the toe insulator (5).

17. An assembly as claimed in claim 16, wherein the clips (3) are clips as claimed in any one of claims 3, 4, 6 or 7, or claim 8 when read as appended to claim 6 or 7, and the notches (34A, 34B) on the clips (3) engage respective projections (52) provided inside the toe insulator cavities (51).

18. An assembly as claimed in claim 16 or 17, further comprising a pair of rail fastening anchoring devices (4) in which respective ones of the rail fastening clips (3) are mounted, each anchoring device (4) having a passageway (45) within which the base portion (32) of a clip (3) is located.

19. An assembly as claimed in claim 18, wherein an upper surface of each anchoring device (4) is formed with a step (442) for inhibiting unintentional removal of the clip (3) from the device (4).

20. An assembly as claimed in claim 18 or 19, wherein the passageway (45) of each anchoring device (4) has a roof (47).

21. An assembly as claimed in claim 20, wherein the

clips (3) are clips as claimed in claim 14 or 15 and a locating projection (48) is formed on the roof (47) inside the passageway (45) in the anchoring device (4) for engaging with the recess (35) on the base portion (32) of the clip (3).

22. An assembly as claimed in claim 20 or 21, wherein the roof (47) extends over almost the entire passageway (45).

23. An assembly as claimed in any one of claims 18 to 22, further comprising a pair of sidepost insulators (7) for insulating the anchoring devices (4) from the rail (1), each anchoring device (4) having means (49) for locating a sidepost insulator (7) thereon.

24. An assembly as claimed in claim 23, wherein each anchoring device (4) has an aperture (49) at the end of the passageway (45) opposite to an entrance thereof, and each sidepost insulator (7) has a portion (71) which projects into that aperture (49), the portion (71) of the sidepost insulator (7) projecting into the aperture (49) having a recess (72) therein into which the base portion (32) of the clip (3) projects, thereby to prevent vertical displacement of the sidepost insulator (7).

25. An assembly as claimed in claim 23 or 24, wherein each anchoring device (4') has a protrusion (401') and a recess (402') at the end of the passageway (45) adjacent to the sidepost insulator (7') and each sidepost insulator (7') has a protrusion (701') which projects into the recess (402'), which protrusions (401', 701') act to resist unintentional vertical displacement of the sidepost insulator (7').

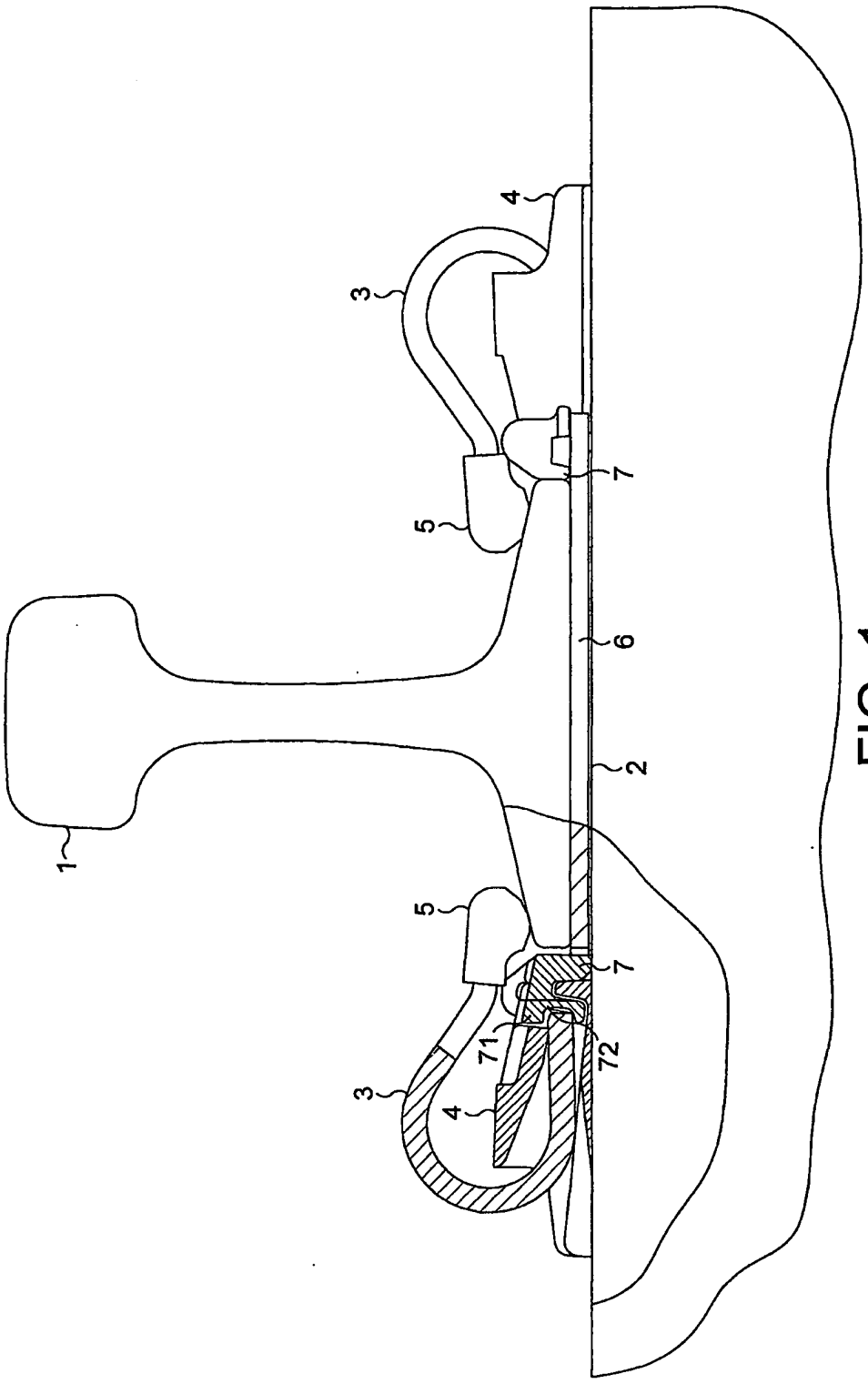

FIG. 1

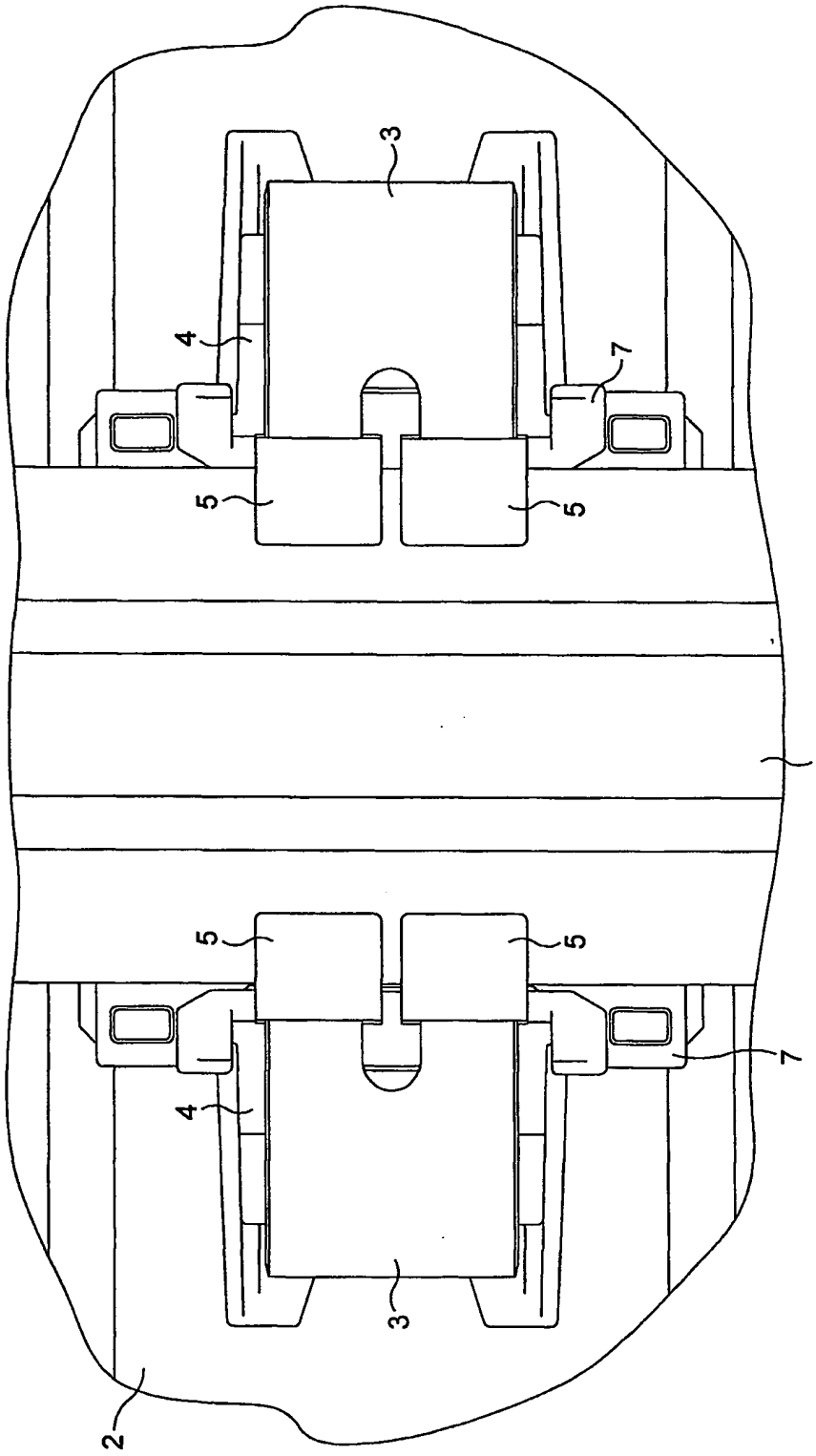

FIG. 2

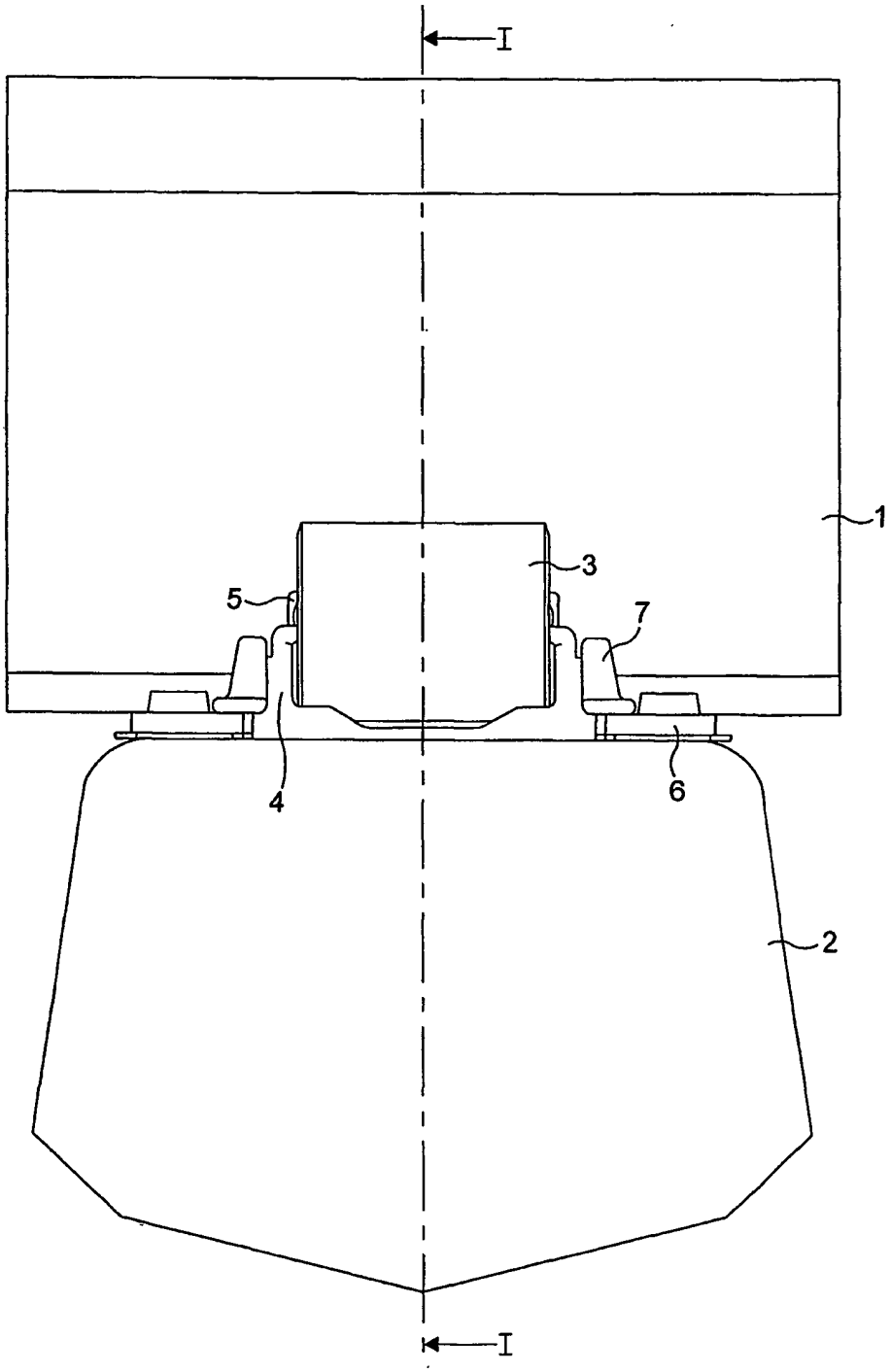

FIG. 3

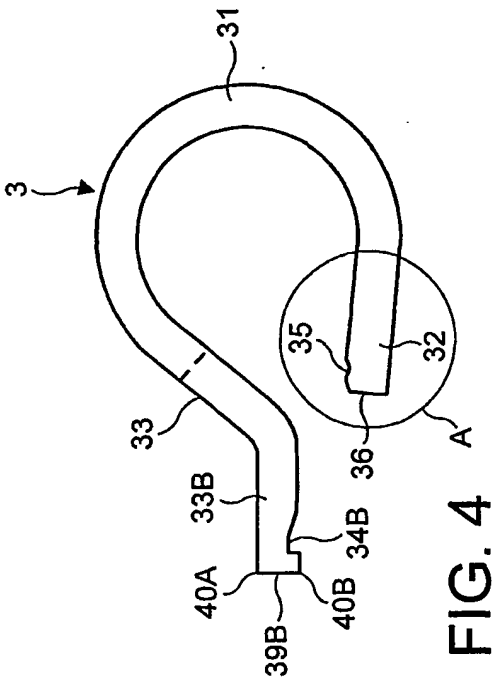

FIG. 4

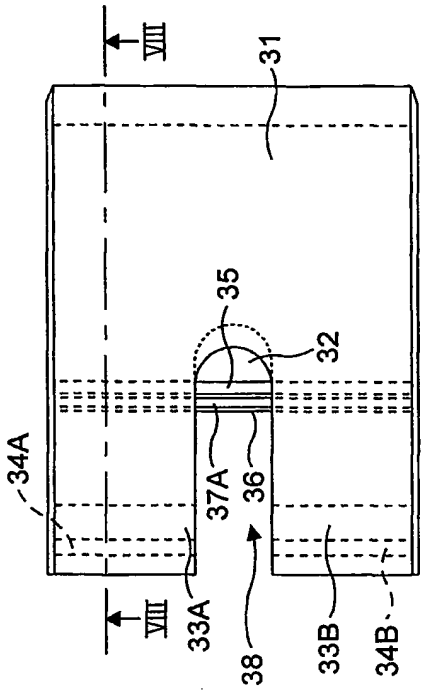

FIG. 5

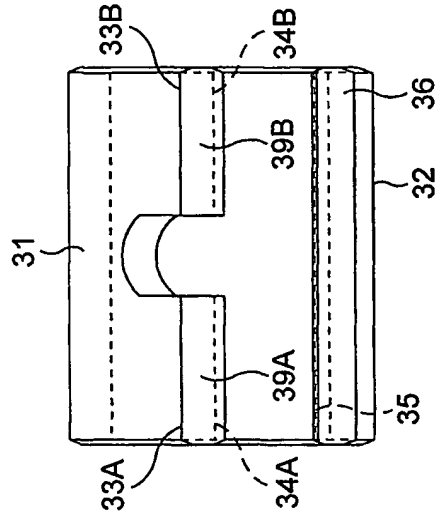

FIG. 6

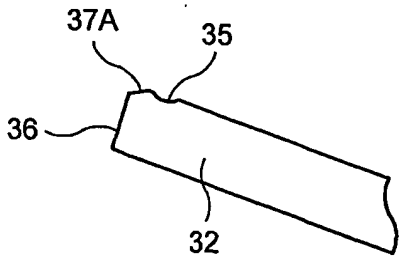

FIG. 7

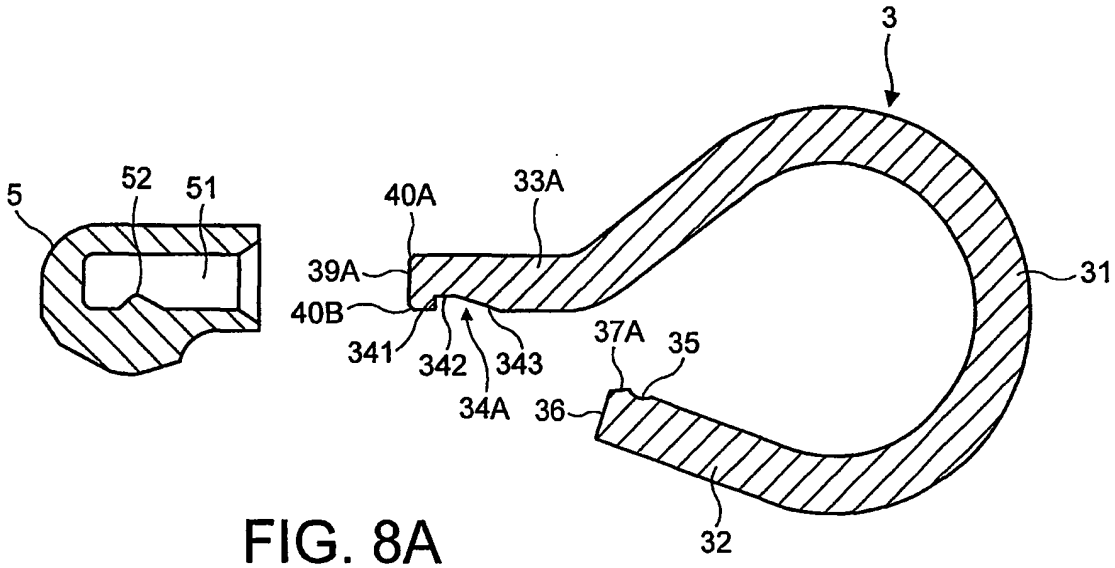

FIG. 8A

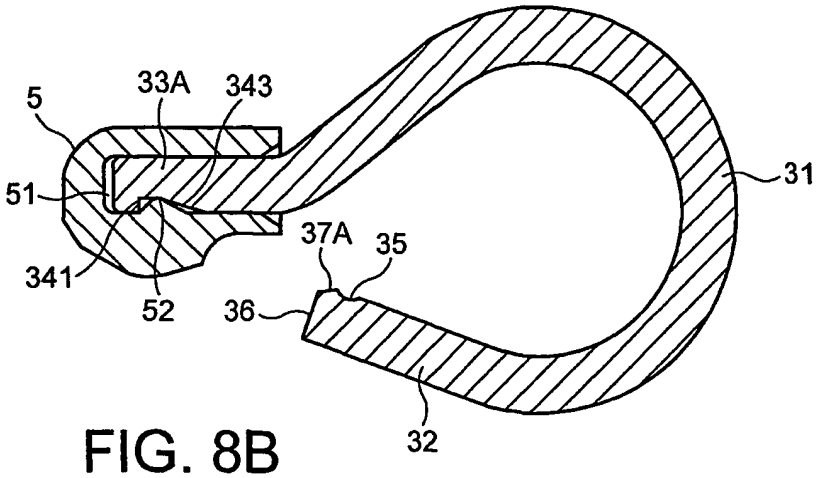

FIG. 8B

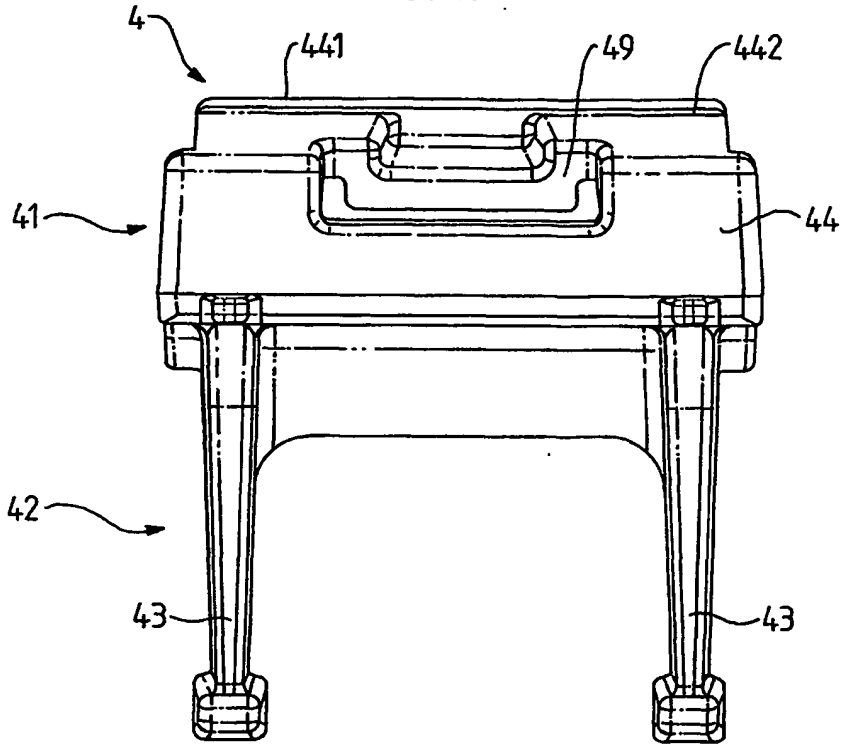

FIG. 9

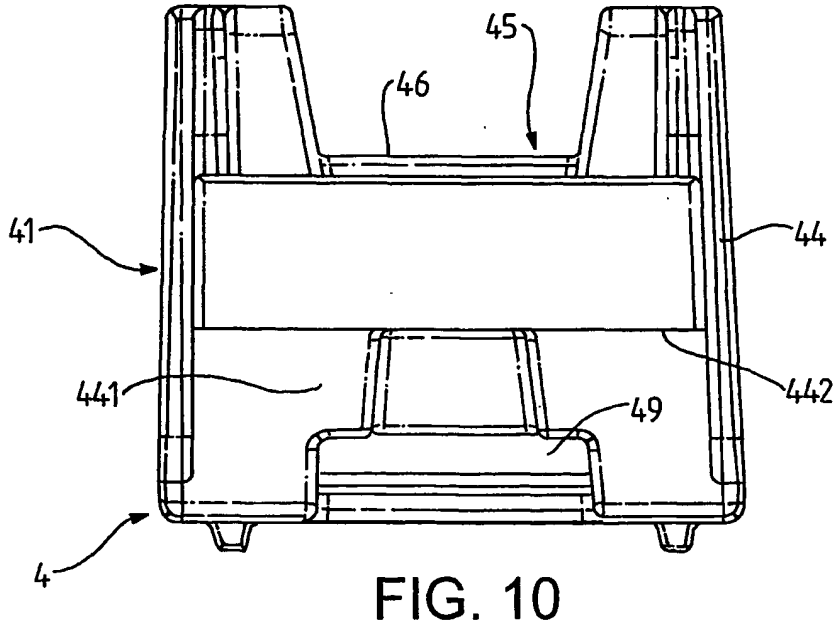

FIG. 10

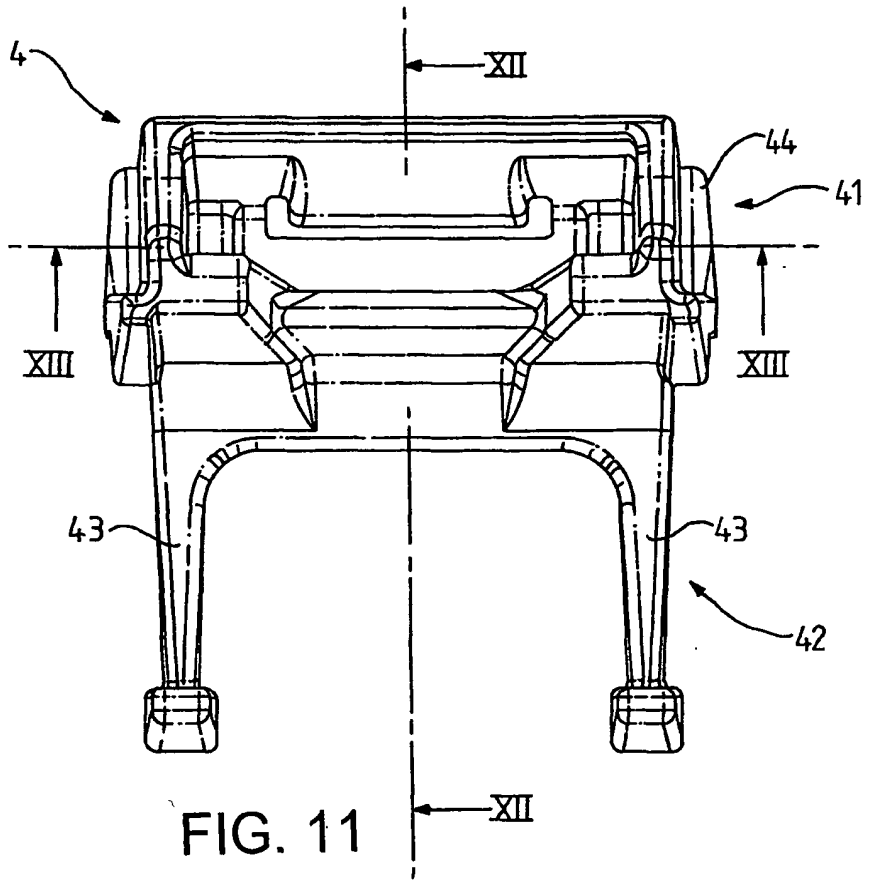

FIG. 11

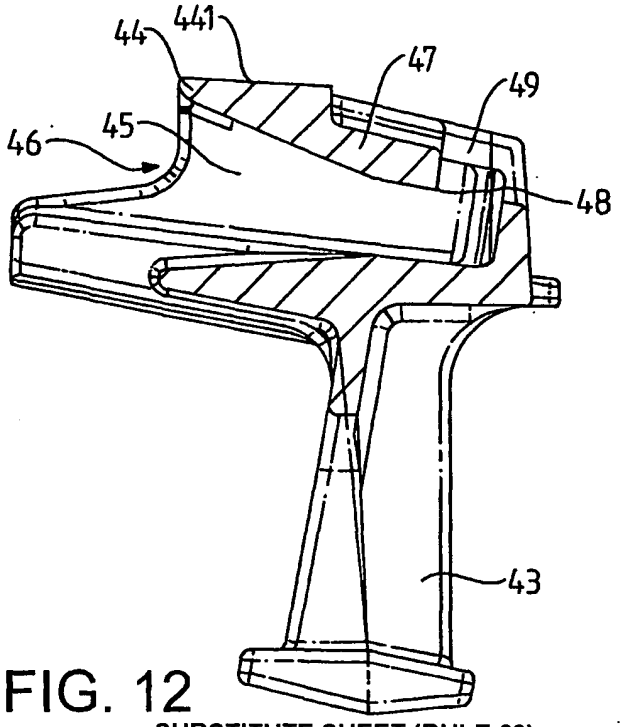

FIG. 12

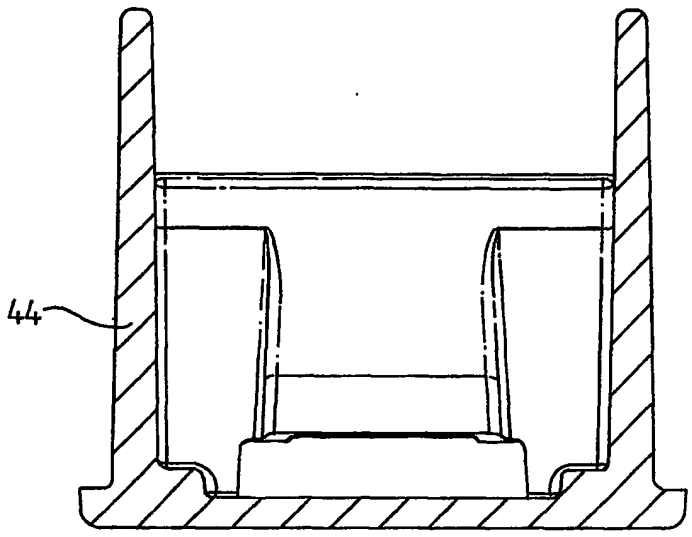

FIG. 13

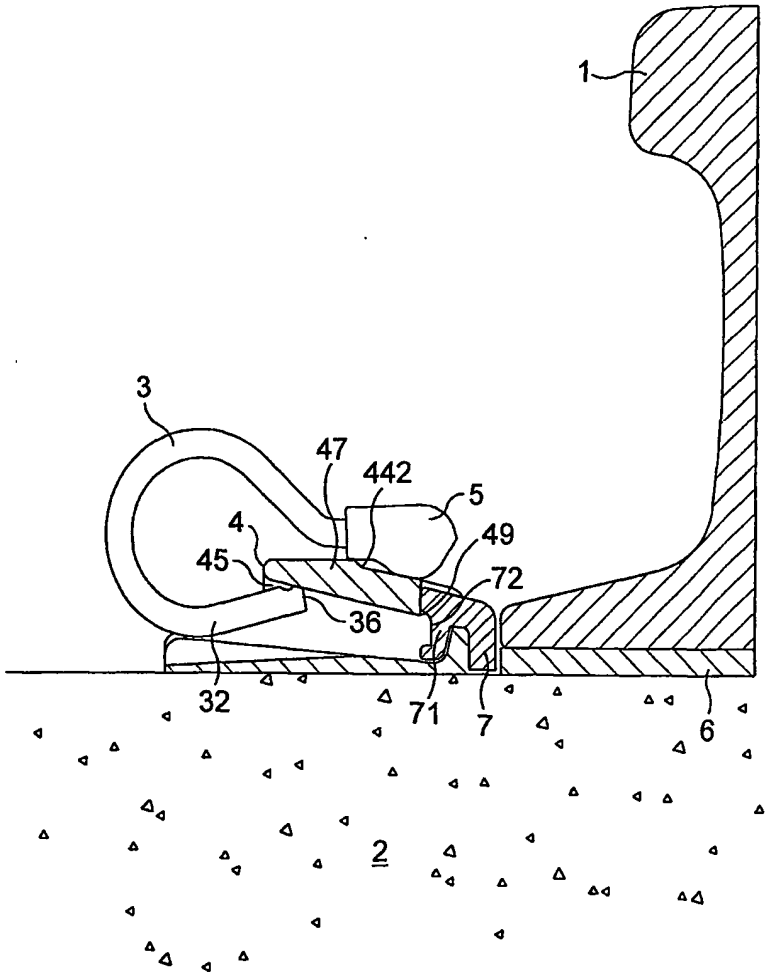

FIG. 14

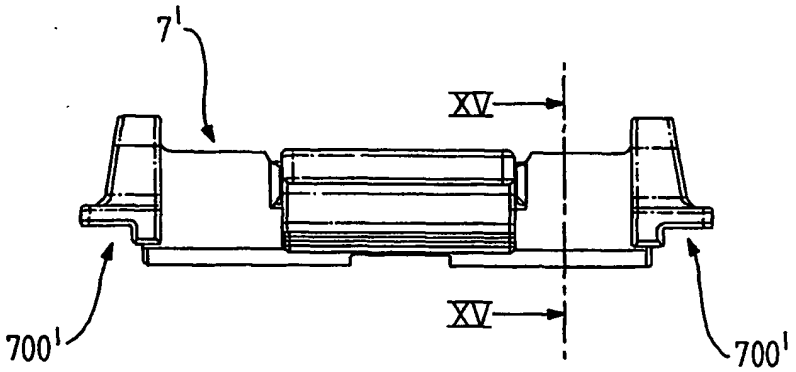

FIG. 15A

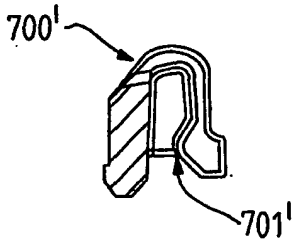

FIG. 15B

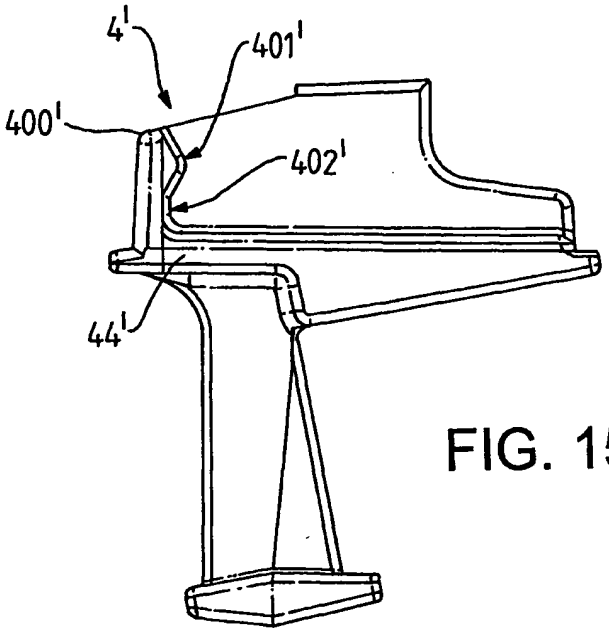

FIG. 15C

INTERNATIONAL SEARCH REPORT

Inte ~ ial Application No
PC1/GB 01/04520

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E01B9/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 E01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 696 418 A (JOHN NORMAN BURNS;SAMUEL BOTTAMS) 2 September 1953 (1953-09-02) page 2, line 21 - line 31; figure 1	1,2,12, 14
A	---	16
X	CH 444 206 A (STEIRISCHE GUSSSTAHLWERKE) 30 September 1967 (1967-09-30) claim 1; figure 1	1,12,13
A	---	16
A	US 5 520 330 A (GARDNER CHRISTOPHER ET AL) 28 May 1996 (1996-05-28) abstract; figures 1,13,14	1,3,6, 13-17
A	---	
	US 5 125 573 A (VANOTTI GERARD) 30 June 1992 (1992-06-30) column 3, line 38 - line 24; figure 5	1,16

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 January 2002	21/01/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	De Neef, K

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